Course Philosophy

The educational philosophy of the district includes preparing students to become skilled individuals dedicated to making positive contributions to the global community. The course philosophy of Anatomy and Physiology parallels that of the district’s philosophy in that students in this course are expected to become knowledgeable in the structure and function of the systems of the human body. The main goals of the course are literacy in the structure and function of the body systems and the integration of that literacy into analyses of current health issues involving those systems. Students at the conclusion of the course should have a foundation for making informed decisions as future responsible members of their local and global communities.
Course Description

Anatomy and Physiology is a double period class which meets every day during the students’ academic week. Anatomy and Physiology is the study of the structure and function of the various body systems. In the process of studying anatomy and physiology, students gain knowledge of many of the various disorders associated with each body system. In addition, students apply their knowledge of the body systems to the analysis of current events in the areas of health and medicine.

Students are expected to acquire a basic understanding of anatomical terminology, the structure of each of the body systems, the function of each system, and how the structure of each system determines its function. Through projects using current magazine articles or internet resources, students are expected to know disorders that occur with each system and be able to communicate, in a written and/or oral presentation, specific information about a particular disability. Students will also perform dissections of various organs and perform other laboratory procedures to further their understanding of the anatomy and physiology of the human body.

The essential questions which determine course scope and content include the following:

- What is the structure of each of the human body systems?
- What is the function of each of the human body systems?
- What are the major disorders of the human body systems and what causes them?
In Anatomy and Physiology 234, the structure and function of the following body systems will be studied:

- Integumentary System
- Skeletal System
- Muscular System
- Nervous System
- Cardiovascular System
- Respiratory System
- Digestive System
- Reproductive System

In addition to the body systems, students will study and be expected to know basic anatomical terminology for locations, planes, and directions. Students will also study the major body cavities and their contents, and the four types of tissue (epithelia, connective, muscle, and neural) which are found in the human body.

As each body system is presented in class, students will examine disorders associated with that body system. The study of system disorders will include investigating causes, prevention, and treatments/cures. Current information in the form of magazine and newspaper articles and/or internet websites will be incorporated into the study of system disabilities.

Course Assessment Plan:

For the Anatomy and Physiology students at McCann Technical School the following assessment plan will be followed:

Grading System:
“Report cards are issued quarterly and serve as a guideline for students and their parents to measure achievement. Parents are encouraged to contact teachers and counselors to ensure a continuing participation in student progress. Parents are also encouraged to utilize the Family Portal in X2 as a means of following student progress. Courses are
graded numerically in accordance with the following values.” (2010-2011 McCann Student Handbook)

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-97</td>
<td>A+</td>
</tr>
<tr>
<td>96-94</td>
<td>A</td>
</tr>
<tr>
<td>93-90</td>
<td>A-</td>
</tr>
<tr>
<td>89-87</td>
<td>B+</td>
</tr>
<tr>
<td>86-84</td>
<td>B</td>
</tr>
<tr>
<td>83-80</td>
<td>B-</td>
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<tr>
<td>79-77</td>
<td>C+</td>
</tr>
<tr>
<td>76-74</td>
<td>C</td>
</tr>
<tr>
<td>73-70</td>
<td>C-</td>
</tr>
<tr>
<td>69-67</td>
<td>D+</td>
</tr>
<tr>
<td>66-65</td>
<td>D</td>
</tr>
<tr>
<td>64-0</td>
<td>F</td>
</tr>
</tbody>
</table>

Anatomy and Physiology Academic Grading Policy:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests, quizzes, projects, portfolios, laboratory experiments, research papers, oral presentations</td>
<td>70%</td>
</tr>
<tr>
<td>Attendance, participation, class assignments, homework, notebook, effort</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Program Outline of Topics and Activities**

Anatomy and Physiology: Grade 12

**Overview of body systems**
- Types of tissue
  - Epithelial, connective, muscle, neural
- Homeostatic regulation
  - Negative and positive feedback loops
- Anatomical terminology
  - Directions, planes, and cavities

**Integumentary System**
- Functions of the Integumentary System
- Layers of epidermis structure and function
- Layers of dermis structure and function
  - Accessory structures
    - Hair follicles, glands, nerve receptors, blood vessels
- Pigmentation and U.V. protection
- Vitamin D production
*Integumentary System disorder project and presentation
*Fingerprint analysis lab

Skeletal System
- Functions of the skeletal system
- Bone anatomy macroscopic and microscopic
- Bone growth, development, and repair
- Classification of fractures i.e.
  - Transverse, greenstick, epiphyseal, spiral, compression
- Identification of major bones of axial and appendicular skeletons
- Articulations - classification and function
  *Skeletal System disorder project and presentation
  *Dissection and lab practical of chicken bones
  *X-Ray analysis activity

Muscular System
- Functions of the muscular system
- Muscle anatomy macroscopic and microscopic
  *Microscope Lab - Identification of Muscle Types
- Muscle fiber contraction physiology
- Organization of muscle i.e.
  - Muscle fascicle, muscle fiber, myofibrils, actin, myosin
- Identification of major skeletal muscles in the human body
- Comparisons of the three muscle types, skeletal, smooth, and cardiac
- Energetics of muscle contraction
  - Aerobic and anaerobic ATP generation
  - All or none principle
  *Muscle System disorder project and presentation

Nervous System
- Functions of the nervous system
- Cellular organization of neural tissue
  - Sensory neurons, motor neurons
  - Peripheral (PNS) and Central (CNS) nervous system
- Anatomy of a neuron i.e.
  - Dendrites, soma, axon, myelin, nodes, synaptic knobs, neurotransmitters
- Classification of neuron cells i.e.
  - Astrocytes, oligodendrocytes, microglia, ependymal and schwann cells
- Neurophysiology
  - Action and resting potential
  - Refractory period
  - Synaptic communication
- Spinal cord anatomy i.e.
-White matter and grey matter
-Dorsal roots, ventral root
-Arachnoid and pia matter

*Spinal cord dissection and lab practical

• Brain anatomy i.e.
  -Cerebrum, cerebellum, thalamus, hypothalamus, pons, medulla oblongata

*Brain dissection and lab practical

**Sensory Function**

• General senses
  -Nociceptors, thermoceptors, mechanoceptors (i.e. tactile receptors, baroreceptors, proprioceptors, chemoreceptors)

• Taste and smell
  -Anatomy of nose- i.e.
    Olfactory bulb, olfactory receptors mucus cilia
  -Anatomy of tongue- i.e.
    Taste buds and pores, gustatory cells

• Vision
  -Anatomy of eye- i.e.
    Muscles, sclera, choroids, cornea, pupil, iris, lens
  -Visual Physiology- rods and cones, myopia (near sighted), hyperopia (far sighted), astigmatism

*Eye dissection and lab practical

• Hearing
  -Anatomy of ear- i.e. pinna, auditory ossicles, vestibular complex, cochlea
  -Physiology of hearing and equilibrium

**Cardiovascular System**

• Functions of cardiovascular system

• Heart anatomy i.e.
  -Arteries, ventricles, valves, pulmonary arteries and veins, aorta, superior and inferior vena cava

*Heart dissection and lab practical

• Systemic and pulmonary circulation

• Physiology of muscle contraction producing heartbeat and resulting electrocardiogram

*Evaluating ECG’s lab

• Blood flow through the circulatory system
  -Veins and venules, arteries and arterioles, capillaries

*Sphygmomanometer and pulse rate lab

**Respiratory System**

• Functions of respiratory system

• Anatomy of respiratory tract i.e.
  -Pharynx, larynx, trachea, bronchi, bronchioles, alveoli, diaphragm

• Respiratory physiology
- Pressure and air flow to the lungs
- Gas exchange of CO2 and O2 between blood, cells and lungs
  *Sheep pluck dissection and lab practical

**Digestive System**
- Functions of digestive system
- Anatomy of the digestive tract i.e.
  - Oral cavity, esophagus, stomach, small intestine, large intestine, rectum
  - Accessory organs i.e. pancreas, liver, salivary glands
- Physiology of peristalsis and the communication between the muscular, nervous, digestive systems
- Regulation of gastric activity- influence of parietal cells and chief cells, phases of the gastric cycle
- Processing and absorption of nutrients through the digestive system
  *Digestive system disorder project and presentation

**Reproductive System**
- Functions of reproductive system
- Anatomy of the male reproductive system i.e.
  - Testes, epididymis, ductus deferens, ejaculatory duct, urethra,
  - Seminal vesicles, prostate gland, bulbourethral glands, scrotum, penis
- Anatomy of Female reproductive system i.e.
  - Ovaries, uterine tubes, uterus, vagina
- Meiotic process of spermatogenesis and oogenesis
- Physiology of ejaculation and ovulation
- Birth control i.e.
  - Vasectomy tubal ligation, oral contraceptives, intrauterine devices
- Genetics and Inheritance
  - Fertilization and zygote formations
  - Stages of embryological development i.e.
    - First, second, and third trimester
  - Labor and delivery
  *Uterus dissection and lab practical

**Standards**

Massachusetts Science and Technology/Engineering Curriculum Framework
Biology High School Standards
Learning Standards for a Full First-Year Course

<table>
<thead>
<tr>
<th>Course Curriculum Topic</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeostatic regulation of the body.</td>
<td>4.1 Recognize that the body’s systems interact to maintain homeostasis.</td>
</tr>
<tr>
<td>Function of the skeletal system. Function of the muscular system.</td>
<td>Describe the basic function of a physiological feedback loop.</td>
</tr>
<tr>
<td>Function of the pulmonary and systemic circuits.</td>
<td>4.5 Explain how the muscular/skeletal system (skeletal, smooth and cardiac muscle, bones, cartilage, ligaments, tendons) works with other systems to support and allow for movement. Recognize that bones produce both red and white blood cells.</td>
</tr>
<tr>
<td>Respiratory physiology and the function of the respiratory system.</td>
<td>4.2 Explain how the circulatory system (heart, arteries, veins, capillaries, red blood cells) transports nutrients and oxygen to cells and removes cell wastes.</td>
</tr>
<tr>
<td>Function of the digestive system.</td>
<td>4.3 Explain how the respiratory system (nose, pharynx, larynx, trachea, lungs, alveoli) provides exchange of oxygen and carbon dioxide.</td>
</tr>
<tr>
<td>Genetics, development, and inheritance.</td>
<td>4.1 Explain generally how the digestive system (mouth, pharynx, esophagus, stomach, small and large intestines, rectum) converts macromolecules from food into smaller molecules that can be used by cells for energy and for repair and growth.</td>
</tr>
<tr>
<td></td>
<td>4.6 Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father and that sexually produced offspring resemble, but are not identical to, either of their parents.</td>
</tr>
</tbody>
</table>
Vocational/Technical Education Curriculum Frameworks  
Strands 1, 4, 5, and 6

1.B Demonstrate health and safety practices:

| 1.B.01a | Identify, describe and demonstrate the effective use of Material Safety Data Sheets (MSDS) |
| 1.B.02a | Read chemical, product, and equipment labels to determine appropriate health and safety considerations |
| 1.B.03a | Identify, describe and demonstrate personal, shop and job site safety practices and procedures |
| 1.B.06a | Locate emergency equipment in your lab, shop, and classroom, including (where appropriate) eyewash stations, shower facilities, sinks, fire extinguishers, fire blankets, telephone, master power switches, and emergency exits |
| 1.B.07a | Demonstrate the safe use, storage, and maintenance of every piece of equipment in the lab, shop, and classroom |

1.C Demonstrate responses to situations that threaten health and safety

| 1.C.01a | Illustrate First Aid procedures for potential injuries and other health concerns in the occupational area |
| 1.C.02a | Describe the importance of emergency preparedness and an emergency action plan |
| 1.C.03a | Illustrate procedures used to handle emergency situations and accidents, including identification, reporting, response, evacuation plans, and follow-up procedures |
| 1.C.04a | Identify practices used to avoid accidents |
| 1.C.05a | Identify and describe fire protection, precautions and response procedures |

4.B Communicate in multiple modes to address needs within the career and technical field

| 4.B.01a | Apply strategies to enhance effectiveness of all types of communications in the workplace |
| 4.B.02a | Apply reading skills and strategies to work-related documents |
| 4.B.03a | Locate information from books, journals, magazines, and the |
| 4.B.04a | Apply basic writing skills to work-related communication |
| 4.B.05a | Write work-related materials |
| 4.B.07a | Explain information presented graphically |
| 4.B.08a | Use writing/publishing/presentation applications |
| 4.B.09a | Apply basic skills for work-related oral communication |

4.C Solve problems using critical thinking

| 4.C.01a | Demonstrate skills used to define and analyze a given problem |
| 4.C.02a | Explain the importance and dynamics of individual and teamwork approaches of problem solving |
| 4.C.03a | Describe methods of researching and validating reliable information relevant to the problem |
| 4.C.04a | Explain strategies used to formulate ideas, proposals and solutions to problems |
| 4.C.05a | Select potential solutions based on reasoned criteria |
| 4.C.06a | Implement and evaluate solution(s) |

4.D Demonstrate positive work behaviors

| 4.D.01a | Identify time management and task prioritization skills |
| 4.D.03a | Demonstrate willingness to learn and further develop skills |
| 4.D.04a | Demonstrate self-management skills |
4.D.07a | Show initiative by coming up with unique solutions and taking on extra responsibilities

6.A Demonstrate proficiency in the use of computers and applications as well as an understanding of concepts underlying hardware, software, and connectivity

6.A.01a | Select and utilize the appropriate technology to solve a problem or complete a task

6.A.07a | Illustrate methods of selecting and using search engines

6.C Demonstrate ability to use technology for research, problem solving, and communication

6.C.01a | Locate, evaluate, collect, and process information from a variety of electronic sources

6.C.03a | Demonstrate the use of appropriate electronic sources to conduct research (e.g., Web sites, online periodical databases, and online catalogs)

6.C.05a | Collect, organize, analyze, and graphically present data using the most appropriate tools

### Instructional Activities

The Anatomy and Physiology course uses the following instructional activities:
- Cooperative learning groups
- Whiteboard projects
- Library/internet research
- Direct instruction
- Coloring anatomical plates
- Power point presentations
- Guest lecturers
- Demonstrations
- Recitation/review
- Videos
- Dissections

### Resources


Online resources:
- [http://www.scilinks.org](http://www.scilinks.org)
- [http://www.intelihealth.org](http://www.intelihealth.org)
- [http://www.mayoclinic.com](http://www.mayoclinic.com)
- [http://lii.org](http://lii.org)